Shyamal 2000

Significance of data collected on birds in Quebec, Canada, by non-standardized methods

p. 66-78 in: Proc. VI-Int Con. Bird Census Work, Göttingen, BRD, 24-29 Sept 1979. ed. H. Oelke.

A. Cyr et J. Larivée
Faculté des sciences
Université de Sherbrooke, Québec J1K 2R1
Kanada

In January 1951, Victor Gaboriault, an amateur ornithologist, initiated a program to census the birds of the province of Québec, Canada, with the help of amateurs in order to collect data that would have lead to a book on the distribution of the birds of Québec. His untimely death led to the foundation of the Club des ornithologues du Québec in 1955, which took over his ideas and methodology on how to collect data on field sheets or field check-lists containing all the main species to be expected in Québec.

It was felt by one of us (J. L.) that these data could help to answer very many questions about the birds of Québec. In 1975, a project called E. P. O. Q. (Étude des populations d'oiseaux du Québec) was set up to render possible an easy retrieval of the numerous data and their statistical analysis. It took three years to put on magnetic tape all the data up to 1976: 38,695 field check-lists and 538,008 recordings.

At present, the data cover the years 1932 to February 1977. The purpose of this paper is not to try replace standardized methods by non-standardized ones, nor is it intended to discourage the use of standardized-ones by amateurs, but simply to look at different kinds of questions that could be answered with already available non-standardized data.

Methodology

The type of data gathered on check-lists are the numbers of individuals of each species seen or heard during any excursion or field trip of whatever length on the same day. The precise locality, date and the name of the observer (s) were noted as well as weather parameters. The number of individuals, the duration of the excursion, or the climatic conditions are not taken down consistently, but it is the simplest form of work that most of our amateurs are willing to undertake. Also, the methodology used was not conceived for refine scientific or statistical analysis. The basic information that was put on the tape is as follow (Fig. 1): Field sheet number, date, latitude and longitude, species number, number of bird reported, sex, locality. The data validation process looked at species that are not usually found in some seasons, regions, abundances, or looked at rare ones, etc ... The data were then double-checked for errors, and those left are believed to be fewer than 0,05 %. If we look at the yearly coverage (Fig. 2), we see that the data collection started slowly with few observers, mostly in the area of Montréal and Québec. The number increased between 1956 and 1961 to collapse in 1965-66 due to the lost of field sheets. However, the number of field sheets has increased ever since. This loss of 1965-66 constitute a first bias in the analysis to come. For most periods, a fairly good sample size of more than 1000 field sheets is available. The sample size fluctuates also through the year (Fig. 3). This reflects mainly the

DATA BANK CONTENT

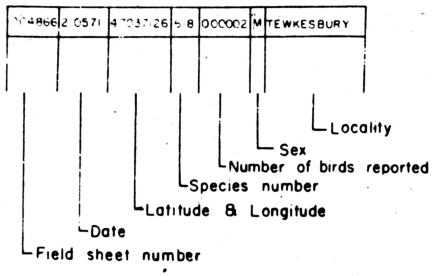

Fig. 1: Basic information of the data bank content

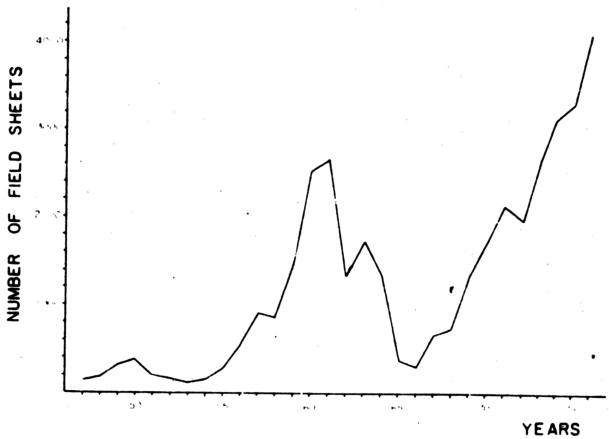

Fig. 2: Yearly coverage of the data bank content

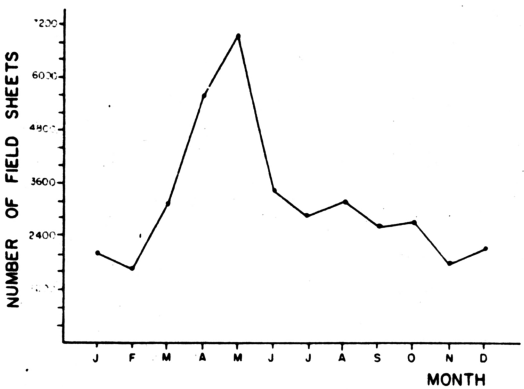

Fig. 3: Monthly coverage of the data bank content

time of the year when amateurs are active in the field. But altogether, sample size is fairly high for each month and, even if the April-May period probably yields more accurate results, the monthly comparison will remain significant in many cases.

Results and discussion

1. Mapping and distribution.

Before sorting material from the bank, we needed to know what the bank contained, because no such information was available. Figure 4 gives a rough estimate of the unevenness of the distribution of the data that cover most of southern Québec. It corresponds well with the distribution of the localities which birders visit, but also with the facility with which the localities may be reached.

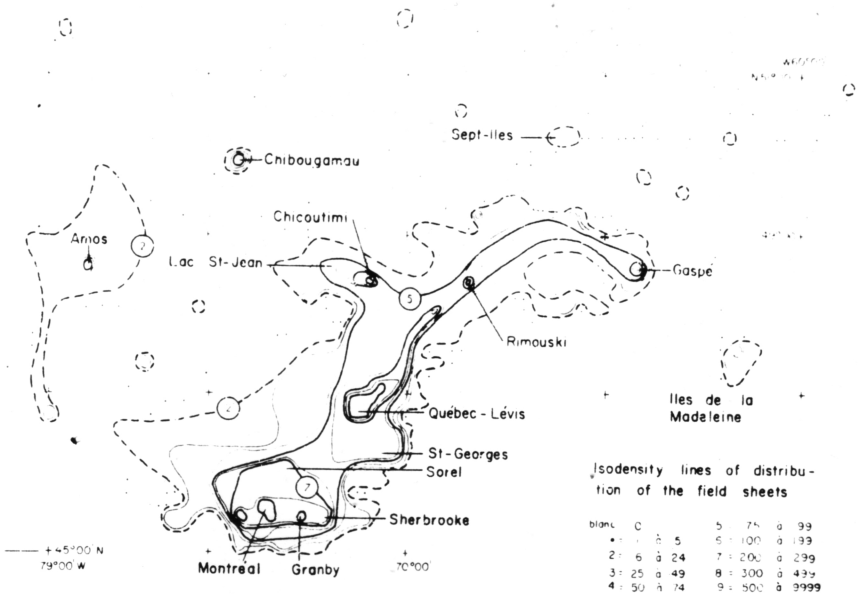

Fig. 4: Isodensity lines of the distribution of the field sheets

From there, we can ask how the bird species are distributed. The quantitative results are expressed relatively as the frequency with which a species is noted over the number of field sheets completed, or as the number of individuals met per field sheet. The information can also be sorted for each area or for time intervals (season, month, week, day). The results for any area or any length of time considered are affected by the sample size. Both items of information can be retrieved simultaneously. An example in Fig. 5 shows the quantitative distribution (frequency of occurence) of the Black Guillemot (Cepphus grylle) when all the data are considered. Depending on the abundance of a species, the scale of frequency or abundance used on the map would have to be slightly modified.

If we consider a smaller area, we can look in more details at the distribution, fluctuations over time and parameters affecting this distribution. Figure 6 shows the distribution of the mean number of individuals of Redwing Blackbird (Agelaius phoeniceus) per 10' x 12' blocks in southeast of Québec in April. We realize how imcomplete is the coverage, when the area is smaller. Although imcomplete, this map tells us that the northwestern part of the area covered contains more Redwings, which corresponds well with the fact that this part lies on

the St Lawrence plains, while those located southeast are more forested and mountainous. The high concentrations correspond to the highly cultivated area which follows the plains of the St Lawrence river as well as the main river system of the area, where man is present.

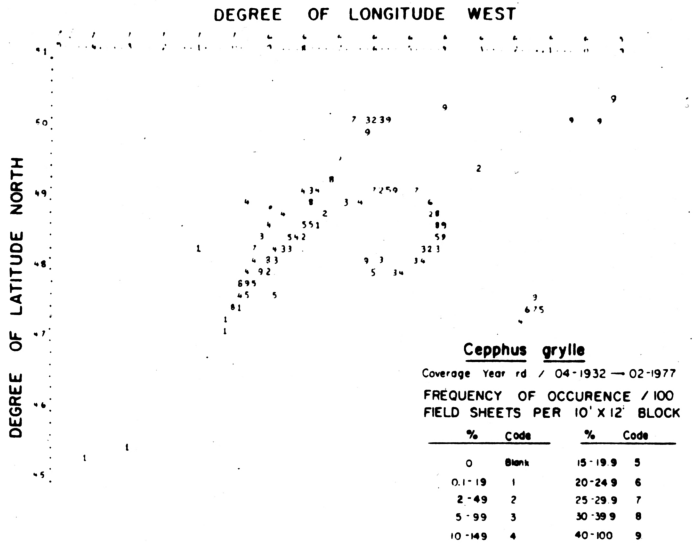

Fig. 5: Frequency of occurence of the Black Guillemot (Cepphus grylle) per 10' x 12' block in Québec

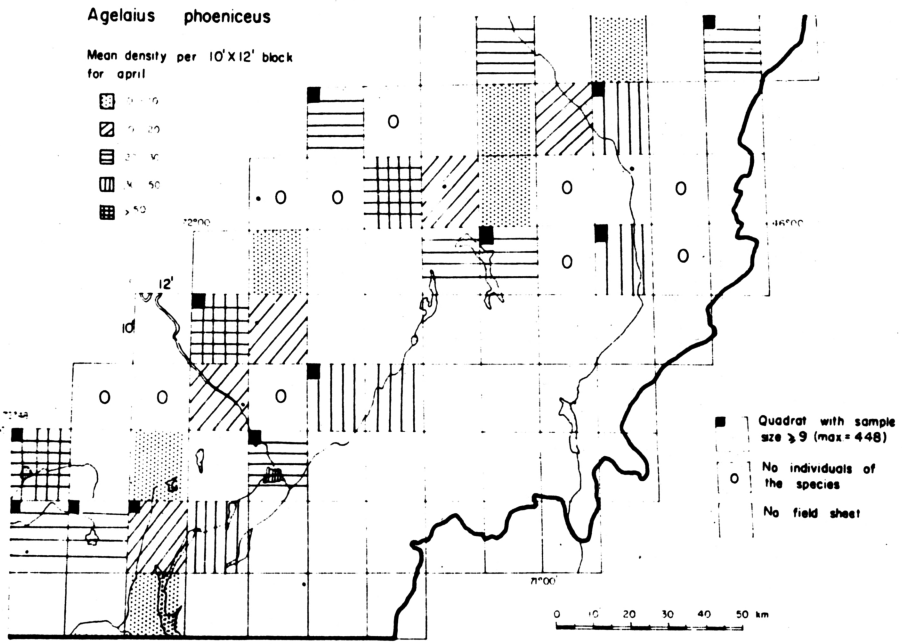

Fig. 6: Quantitative distribution of the Redwing Blackbird in April in south-east of Québec

The data of the bank could also be used to look at and seek out explanations for the range extensions which have occurred over the past two decades, such as those of the Wood thrush (Hylocichla mustelina), the Mockingbird (Mimus polyglottos), the Cardinal (C. cardinalis) and the Gadwall (Anas strepera) (Cantin et al., 1976; Ouellet, 1970).

2. Fluctuations in time

a) Seasonal fluctuations

N. David (unpublished data) used the bank to discover how each species fluctuates over the year. He separated the results into three regions to get comparable sample sizes from three different areas. The graphs obtained gave interesting insight into biogeographical problems. The pattern of migration for each species can be seen at a glance, as can the seasons when they peak and how they are distributed in space at different times of the year (see for ex. Fig. 7 to 9). Some biases are still unavoidable though, such as those inherent to rare species, and those for species that are not conspicuous to the same extent all the year round. Such cases will have to be dealt with cautiously in further analysis. To our knowledge, there are no other data available in Québec comparable with those of our data bank, with which to analyse the seasonal fluctuations of the bird populations.

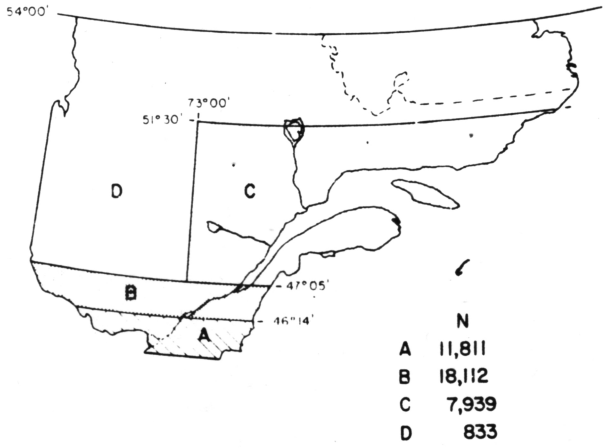

Fig. 7: Sample size and regions covered by Figures 9 and 10

b) Yearly fluctuations

Comparisons between years for the same month or season are also necessary to know to what extend some species are declining or increasing and why. From the study of the frequency distribution from 1956 to 1976 for the warbler family (Parulidae), it is felt that most of these species are declining (Table 1).

The analysis could not include the years 1956 to 1961, because of insufficient sample size. For example, in Fig. 10, the fluctuation is much stronger for Dendroica tigrina before 1962 than after. This figure gives four examples of fluctuations from light increase to strong decrease. One drawback of this analysis is that the data used are frequencies.

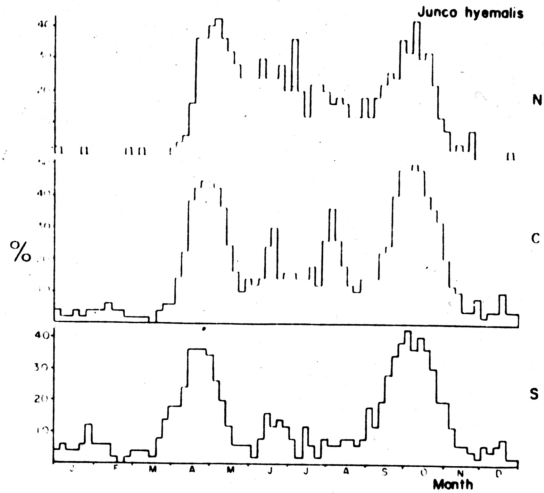

Fig. 8: Frequency distribution (% of field sheets) of the Dark-eyed Junco (Junco hyemalis) over the year for southern (S), centre (C) and northern (N) part of Québec (A, B and C of Figure 7)

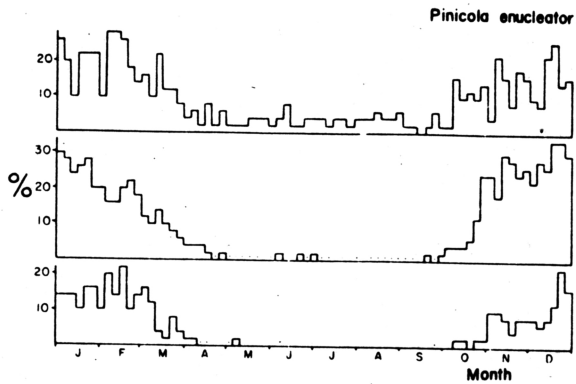

Fig. 9: Frequency distribution (% of field sheets) of the Pine Grosbeak (Pinicola enucleator) over the year for southern, centre and northern part of Québec (A, B and C of Figure 7)

One could easily argue that our results represent more a shift in the observers' way of birding, which cannot be denied. General comparisons with BBS results could not be made with published reports (Erskine 1978), because the Québec data of the BBS are usually analysed jointly with those from Ontario.

Using the raw data of BBS data bank for Québec-routes for comparisons, the trends found in our results follow most often those of the BBS results, even if the workable period is different: 1962 to 1976 for E.P.O.Q. and 1970 to 1977 for BBS - Québec (see Fig. 10 and Table 1). The reliability of our results seems good, but the comparisons are somewhat awkward, because the number of BBS routes in Québec averaged only 20,3 up to 1977. We increased this coverage to 36 and 39 in 1978 and

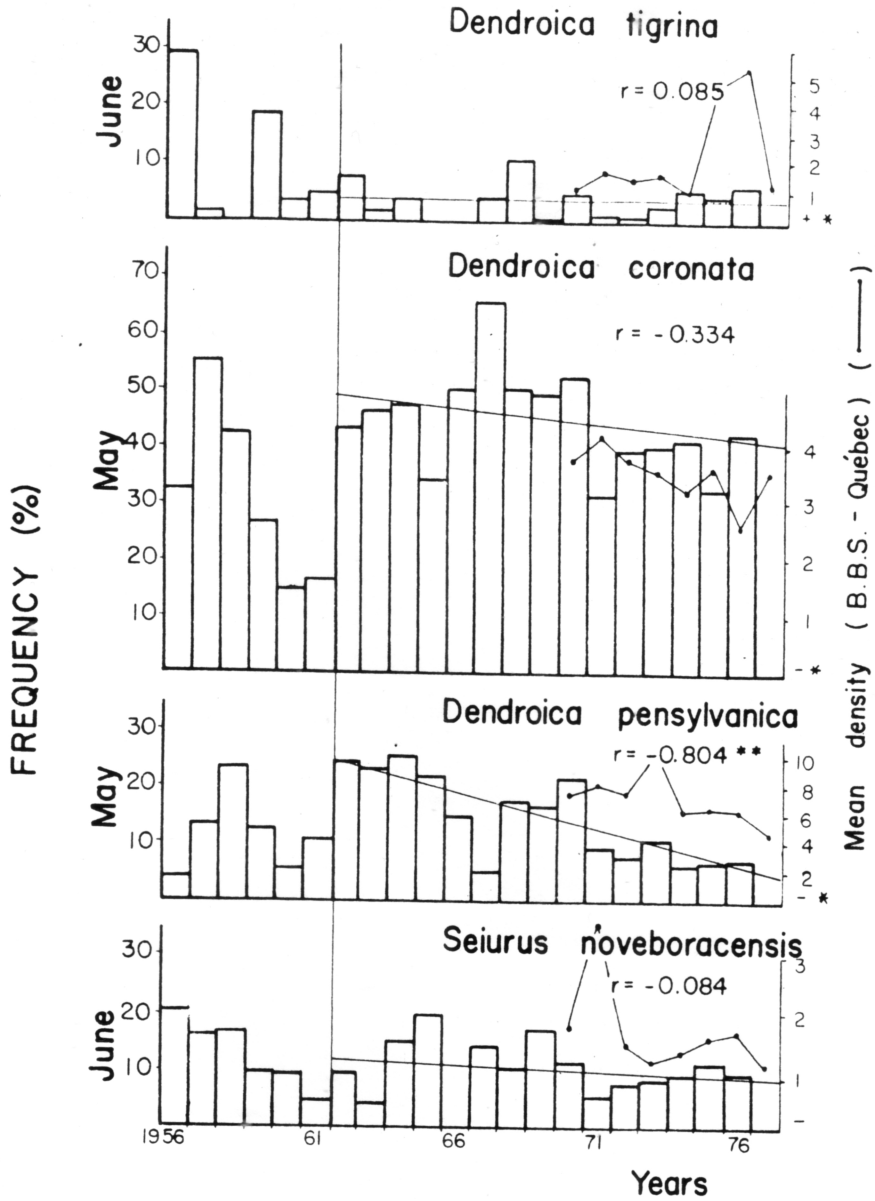

Fig. 10: Frequency distribution of 4 warbler species (Parulidae) from 1956 to 1976. Comparisons are made with density distributions from B. B. S. -Quebec results from 1970 to 1977. Regression coefficient of Dendroica coronata and D. pensylvanica for June from our data bank are -0.407 and -0.708 ++ and follow also the same trends as the B. B. S. results. The stars at the bottom of the right vertical axis and the sign (+ or -) indicate the direction of the tendencies and the significance level of B. B. S.-results.

1979 which should improve the value of future comparisons between the results by both methods. As a whole, the results from E. P. O. Q. have the advantage over BBS that they extend further back in time.

Table 1: Decline of the warbler species (Parulidae) in Québec. (Based on frequency distribution from 1962 to 1976).

	Number of species						
	negative correlation				positive correlation		Total
	95% signif.		not signif.		not signif.		
Genus	May	June	May	June	May	June	
Mniotilta	1	1		(1)			1
Vermivora	2	1 (1)		1		(1)	2
Parula	1	1		(1)			1
Dendroica	5	5 (4)	4	4 (3)	1	1 (3)	10
Seiurus	2	1		1 (1)		(1)	2
Oporornis	1	1 (1)					1
Geothlypis	1	1		(1)			1
Wilsonia	2	1 (1)		1 (1)			2
Setophaga	1	1		(1)			1
TOTAL	16	13 (7)	4	7 (9)	1	1 (5)	21

Note: Data from Breeding Bird Survey in parenthesis for comparison.

sample size is the major problem. If we want to analyse fluctuation in time for such an area, we soon realize that some blocks were well censused during one five-year period, but almost not in the others; that many blocks are poorly sampled; and that some are not sampled (up to 1976 at least). The analyses are still meaningless in many small areas taken one at a time. What is needed for many of them is an effort to increase the sample size, which should reach, at least at first, 45 field sheets per block: the size from which it takes 10 new sheets to increase by less than 5 % the number of species noted (Fig. 11). The goal of 77 field sheets would be more useful for the quality of the results, but would be more time-consuming!

Some information and explanations can still be gained by looking at some small areas in relation to the main type of habitat found in those small area or some other parameters. From Fig. 12, we see that the distributions of frequencies or densities are independant of sample size; but, when sample size is too low in some months, the results are less meaningful, as in blocks 13 or 8.

A comparison between blocks 55 and 59 reveals that the main habitat types of each block account for the patterns of the distributions of frequencies or densities of the Redwing Blackbird. The first one is a city surrounded mostly by cultivated areas, whereas the second contains also a city largely surrounded by forest. The distribution pattern of the density in block 55 is typical for an area where the habitat is suitable for the species. In contrast, the densities are lower in block 59, except for a peak that is caused by the presence of a roost in the middle of the city. The pattern for the densities of block 36 is comparable with the one of block 55 except for a later arrival of the birds in March, this block lying farther north. Again,

unevenly distributed data through the year means that a sample size of about 100 is still too low for small area.

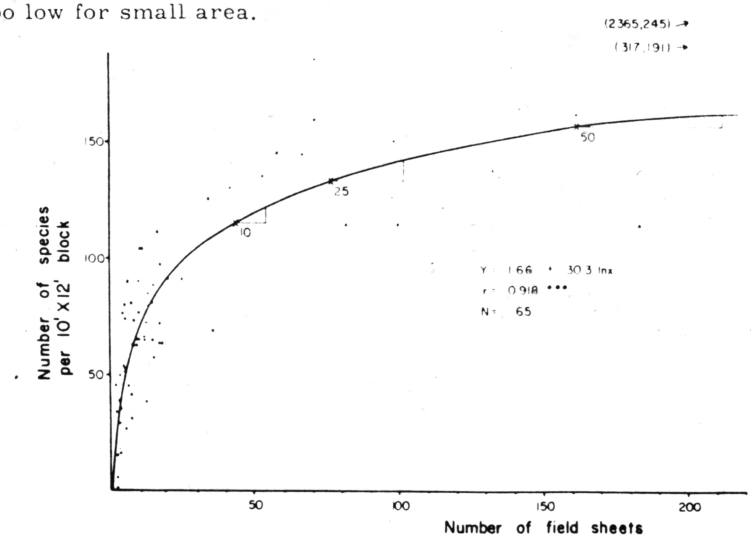

Fig. 11: Relationship between the number of field sheets and the number of species recorded per 10' x 12' block. X's along the log-curve indicate the effort to increase by less than 5 % the number of species.

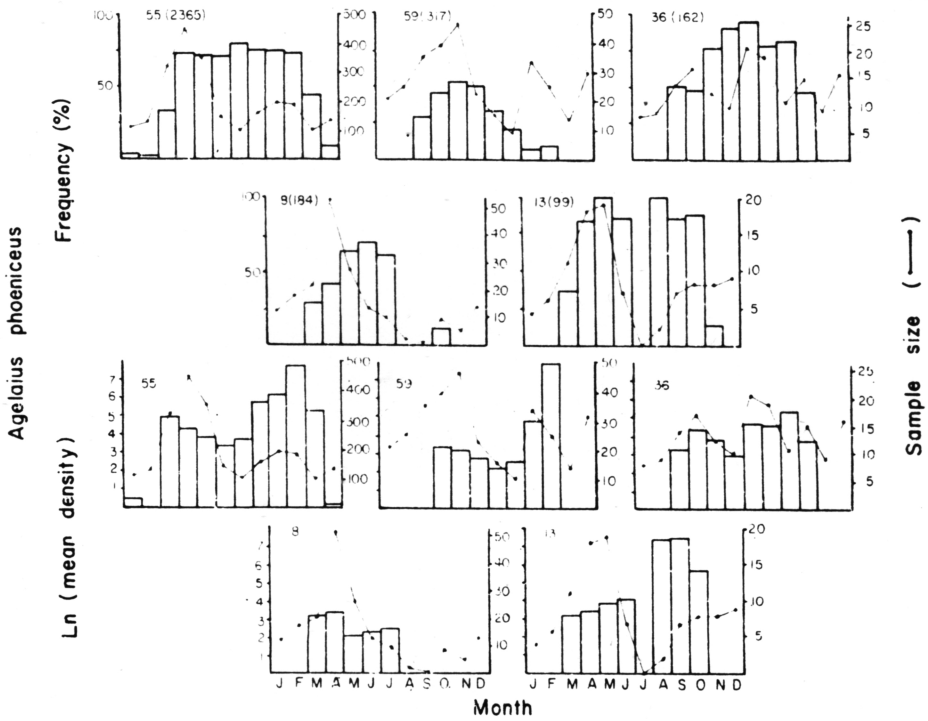

Fig. 12: Monthly distributions of frequencies and densities for Redwing Blackbird in five 10' x 12' blocks against sample size.

3. Conservation, management and planning

The bank has already been asked to provide data for specific localities where there were fortunately many data. Such localities were going to suffer or were already suffering from "filling up" operations and drainage for economic reasons, such as road construction along the St. Lawrence river. For example, a report on the birds of the Rimouski salt marshes was successfully used as evidence against a "filling up" operation. These types of actions and other can be undertaken if the bank is used wisely as a management tool as well as to inform politicians about bird communities of specific areas, of broad habitat types or even about rare and endangered birds to be preserved.

The future

The first step is to consider what we have available up to now, what it can express and to what extent it is useful and valuable. Because data are available and are still being gathered at an increasing rate, as noted in Fig. 2, we expect to widen the use of the bank by the contributors and to guide our contributors to those less-covered areas and seasons of our province. Although many biases are still inherent in the data, we do feel that their quantity well compensates for them not being standardised and that they will enable us to throw some more light on many aspects and problems of our birdfauna.

Acknowledgements

The U.S. Fish and Wildlife Service and Dr D. Bystrak and the C.W.S. (K. Freemark and Pat Cadieux) are to be acknowledged for giving access to BBS-Québec results from 1966 on. L.M. Thériault helped with the drawings. N. David kindly allowed us to use some results before publication. J.T.R. Sharrock, J. Cyr and L. Jobin made helpful comments on the manuscript.

Summary

The Club des Ornithologues du Québec has gathered over more than 25 years, field check lists each containing number of individuals of each species observed during field trips. These observations are collected by non-standard procedures. Because of the huge amount of available data and in order to render them useful, they were put on computer. The authors analyse some types of biological questions that could be answered by these data. This includes problems related to quantitative, spatial and temporal distribution of the species and to seasonal or yearly fluctuations in time. Also, they already proved useful for conservation and management purposes.

Zusammenfassung: Aussagefähigkeit von Vogelbeobachtungen, gewonnen aus nicht-standardisierten Erfassungen in der Provinz Québec, Kanada.

Der Ornithologische Klub Québec hat mehr als 25 Jahre hindurch Beobachtungskarten gesammelt, die die Anzahl von Individuen jeder Vogelart während einer Exkursion enthalten. Diese Beobachtungen wurden nach nicht-standardisierten Verfahren (also zufällig) gewonnen. Die immense Menge verfügbarer Daten ist, um sie nutzbringend anzuwenden, per EDV bearbeitet. Die Autoren analysieren einige Typen biologischer Fragen anhand dieser Daten. Erfaßt werden Probleme in Relation zur quantitativen,

räumlichen und zeitlichen Verteilung der Arten und zu jahreszeitlichen oder jährlichen Schwankungen. Schon dieses Verfahren erwies sich für die Zwecke des Vogelschutzes und Naturschutzes als nützlich.

Reference

Cantin, M., A. Bourget et G. Chapdelaine (1976): Distribution et écologie de la reproduction du canard chipeau (Anas strepera) au Québec. Nat. Can. 103: 469-481.

Erskine, A.J. (1978): The first ten years of the co-operative Breeding Bird Survey in Canada. C.W.S. Rep. 42, 61 p.

Ouellet, H. (1970): Changes in the birdfauna of the Montreal region, Canada. Can. Field-Nat. 84: 27-34.

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Note: Data from Breeding Bird Survey in parenthesis for comparison.

c) Small-scale fluctuations

Let us take a closer look again at a smaller area: l'Estrie. We realize that the sample size is the major problem. If we want to analyse fluctuation in time for such an area, we soon realize that some blocks were well censused during one five-year period, but almost not in the others; that many blocks are poorly sampled; and that some are not sampled (up to 1976 at least). The analyses are still meaningless in many small areas taken one at a time. What is needed for many of them is an effort to increase the sample size, which should reach, at least at